

CLAIMS

What is claimed is:

- 1 1. An acoustic imaging system, comprising:
2 a transducer including a two-dimensional transducer element matrix array, the
3 transducer having a protective cover configured to mate with a transducer body, the
4 protective cover superposed above the two-dimensional transducer element matrix
5 such that acoustic energy incident at the protective cover is mechanically directed by
6 the protective cover and wherein the transducer element matrix array is encased by the
7 protective cover and the transducer body; and
8 an image processing system coupled to the transducer configured provide a
9 plurality of individualized excitation signals to the plurality of transducer elements
10 over time such that the two-dimensional transducer element matrix array generates
11 and transmits acoustic energy through the protective cover over time such that
12 acoustic energy transmitted through the protective cover is electronically focused.
- 1 2. The acoustic imaging system of claim 1, wherein the protective cover
2 comprises an acoustic material, the acoustic material exhibiting acoustic impedance
3 corresponding to acoustic impedance of a body to be imaged.
- 1 3. The acoustic imaging system of claim 1, wherein at least one of the
2 dimensions of the two-dimensional transducer element matrix array is curved.
- 1 4. The acoustic imaging system of claim 1, wherein the protective cover
2 is constructed with a non-uniform thickness.
- 1 5. The acoustic imaging system of claim 1, wherein the protective cover
2 has an acoustic impedance of between approximately 1.3MRayl and 1.7MRayl.
- 1 6. The acoustic imaging system of claim 1, wherein the protective cover
2 has a transducer-engagement having a tissue-engagement surface, the transducer-
3 engagement end being configured to engage a transducer body, the tissue engagement
4 surface forming a portion of a substantially cylindrical surface.

1 7. The acoustic imaging system of claim 6, wherein the tissue
2 engagement surface forms a portion of a substantially spherical surface.

1 8. The acoustic imaging system of claim 1, wherein the transducer body is
2 ergonomically adapted to be grasped by the hand of an operator.

1 9. The acoustic imaging system of claim 1, wherein the protective cover
2 has a shape that reduces the probability of a sonographer developing a repetitive
3 motion injury.

1 10. The acoustic imaging system of claim 1, wherein the image processing
2 system electronically focuses transmitted acoustic energy at a target by compensating
3 for the non-uniform acoustic delays caused by the protective cover.

1 11. The acoustic imaging system of claim 10, wherein the electronic
2 compensation is a function of the position of the target point.

1 12. The acoustic imaging system of claim 1, wherein the image processing
2 system receives a plurality of individualized receive mode signals from a plurality of
3 transducer elements, the receive mode signals representative of the incident acoustic
4 energy at a plurality of the transducer elements of the two-dimensional transducer
5 element matrix array that traverses the protective cover.

1 13. The acoustic imaging system of claim 12, wherein the image
2 processing system electronically focuses the acoustic energy received through the
3 protective cover.

1 14. The acoustic imaging system of claim 13, wherein electronic focusing
2 comprises compensating for the non-uniform acoustic delays caused by the protective
3 cover.

1 15. The acoustic imaging system of claim 13, wherein the electronic
2 compensation is a function of the position of the target point.

1 16. The acoustic imaging system of claim 15, further comprising:
2 means for accessing an acoustic window of a body to be imaged.

1 17. The acoustic imaging system of claim 16, wherein the accessing means
2 comprises placing the transducer between adjacently disposed ribs of the body of a
3 patient.

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1 18. A method for acoustically imaging a patient, comprising the steps of:
2 providing a transducer having a two-dimensional transducer element matrix
3 array, the transducer having a protective cover configured to mate with a transducer
4 body, the protective cover superposed above the two-dimensional transducer element
5 matrix such that acoustic energy transmitted from the protective cover and into the
6 body is mechanically directed by the protective cover, wherein the two-dimensional
7 transducer element matrix array and the protective cover are shaped to reduce patient
8 discomfort;
9 generating a plurality of time delayed transmit signals to separately control
10 individual transducer elements of the two-dimensional transducer element matrix
11 array to electronically focus acoustic transmit waves that traverse the protective cover;
12 and
13 receiving a plurality of time delayed response echoes at the separately
14 controllable individual transducer elements of the two-dimensional transducer element
15 matrix array to electronically focus acoustic receive echoes that traverse the protective
16 cover.

1 19. The method of claim 18, further comprising the step of: processing the
2 reflected acoustic echoes to generate an image.

1 20. The method of claim 18, further comprises the steps of: accessing an
2 acoustic window of a patient; and
3 transmitting acoustic energy through the protective cover and into the patient
4 via the acoustic window.

1 21. The method of claim 18, wherein the steps of generating and receiving
2 further comprise:
3 electronically focusing the acoustic energy in an elevation dimension; and
4 electronically focusing the acoustic energy in a lateral dimension.

22. The method of claim 20, wherein the step of accessing an acoustic window comprises an acoustic window formed between adjacently disposed ribs of the patient.

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